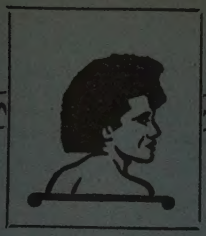
VOL. 18 NO. 4 DECEMBER, 1947



COLONY OF FIJI

AGRICULTURAL JOURNAL

ISSUED BY THE
DEPARTMENT OF AGRICULTURE, FIJI

PRICE : ONE SHILLING AND SIXPENCE

GOVERNMENT PRESS, SUVA, FIJI

Notes for Libraries and Research Institutes.

FORMER ISSUES OF AGRICULTURAL JOURNAL.

So many requests are received from abroad for parts of the *Agricultural Journal* which were never published that the following list of all issues published and those which are not now available is given for reference. Attention is especially directed to Volume 7 which had only one part:—

Vol.			*Vol.*		
1.	3 numbers,	1928.	10.	4 numbers,	1939 (none of Nos. 2 and 4).
2.	4 ,,	1929.	11.	4 ,,	1940 (none).
3.	3 ,,	1930 (none).	12.	4 ,,	1941 (none of Nos. 1 and 2).
4.	4 ,,	1931.	13.	4 ,,	1942.
5.	2 ,,	1932 (none of No. 2).	14.	4 ,,	1943.
6.	2 ,,	1933.	15.	4 ,,	1944.
7.	1 ,,	1934.	16.	4 ,,	1945.
8.	4 ,,	1935–37 (none of No. 4).	17.	4 ,,	1946 (none of No. 1).
9.	4 ,,	1938 (none of Nos. 2, 3 and 4).			

ISSUES OF THE AGRICULTURAL CIRCULAR.

NUMBERS and year of issue of the *Agricultural Circular* :—

Vol. 1, 1920, 12 numbers.
2, 1921, 5 ,,
3, 1922, 4 ,,
Vol. 4, 1923, 1 number.
5, 1924–5, 2 numbers.

As number 4 of Vol. 3 was printed as " Volume 4 " and number 1 of Vol. 4 as " Volume 5 " it would appear from an inspection of a complete set that Volume 4 comprised only a number 4 and that there were two issues of Volume 5, No. 1.

ANNUAL BULLETINS.

THE Annual Bulletin of Divisional Reports ran from 1931 to 1938 and was then discontinued.

OLD ISSUES OF AGRICULTURAL BULLETINS.

FREE copies of the following Bulletins are available to Colonial Departments of Agriculture research institutes and bona fide planters within the Colony.

No. 1. Sisal Hemp in Fiji, 1911.
3. Rhinoceros Beetle in Samoa, 1912.
4. The Banana in Fiji, 1912.
5. Scale Insect on Bananas, 1913.
6. Lemon Grass, 1913.
7. A Mission to Java for a Coleopterous Pest of Bananas, 1914.
8. Coconut Experiments, 1915.
9. Soils of Fiji—I, 1916.
11. Alluvial Soils of Fiji, 1919.
12. Leaf Moth of Coconuts, 1919.
13. Sea Island Cotton, 1920.
14. Transparent Coconut Scale, 1921.
15. Purple Leaf Moth of Coconuts, 1924.
18. Control of Coconut Spike Moth, 1935.

The following are available to the public at the prices shown—

No. 21. Biological Control of the Rhinoceros Beetle, 1941. Price 1s.
21A. Fijian Plant Names, 1942. Price 3s. 6d., 4s. and 6s.
22. An introduction to the Mosquitoes of Fiji, 1943. Price 1s.
23. Insect Pests in Fiji, 1946. Price 1s.
Gardening Notes, Insect Pest Control and Plant Diseases, 1945. Price 1s.

Applications should be made to the Librarian, Department of Agriculture, Suva, Fiji.

—EDITOR.

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(as at 31st December, 1947).

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AGRICULTURAL JOURNAL

ISSUED BY THE

DEPARTMENT OF AGRICULTURE, FIJI

VOL. 18 DECEMBER, 1947. No. 4

EDITORIAL

INDUSTRIAL DEVELOPMENT—THE COLONIAL DEVELOPMENT CORPORATION

There is a growing awareness in the Colony of the need for diversification of our agricultural effort and the development of industries associated with established agriculture or raw material which could be readily grown and economically manufactured in Fiji.

This Editorial was prepared before the announcement was made regarding an adjustment to the development plan for the Colony.

We are only too conscious of the dangers inherent in a system of complete reliance on a few export crops such as sugar, bananas, and copra. We have witnessed in the past 25 years the reduction of our banana trade from 1,000,000 cases in 1921 to a mere 100,000 in 1947. Coconut planters with the experience of the 1930's behind them cannot look to the future with the reasonable assurance that prices will be adequate in 1950. Even the well-organized cane sugar industry, the most important of our export crops, and the main prop of our agricultural economy, has a serious rival in the rapidly expanding beet sugar industry.

We must find new crops, new markets, and new industries. It would be foolish to tie ourselves completely to our three principal export crops and buffer falling prices by an order of self-sufficiency in food. This is important but it is not enough. The Colony has a 10-year development plan directed to improvement in agricultural, medical, educational and other social services, and designed to improve the standard of living and the general well-being of the citizens of the Colony. To do this we must have expanding export business; we must sell goods outside the Colony to buy the means of accomplishing our development plans.

Under agricultural policy every endeavour will be made to improve old crops and establish new. Agriculture will be planned and diversified to meet the needs of soil fertility maintenance and to provide adequate good quality food for the people of the Colony. Markets and market requirements are being explored. Already important developments in several directions have taken place and more will be accomplished when station facilities and staff provided for by Legislative Council are available.

More attention and support must be given, however, to the establishing of industries if we are to improve our overall economy. Officers of the Department of Agriculture, down the years, have given thought to this need; and articles have appeared in the *Journal* dealing with banana flour and figs, candlenut oil, coconut oil, coir and other fibres, desiccated coconut, essential oils, tapioca starch, leather, industrial alcohol to mention but a few. In the last few years important new industries such as coconut-oil expulsion and soap making have forged ahead under the profitable prices now offering. More recent developments include the expression of candlenut oil, the manufacture of banana figs, and the production of leather from local material. The need for industrial development was referred to by several speakers during the consideration by Legislative Council of the "Ten Year Development Plan" in November 1946; and in the March session of

Legislative Council in 1947 the important "Protection of Industries Bill" was adopted.

Private enterprise will develop certain industries which lend themselves to favourable exploitation under local conditions. It is not likely, however, that private enterprise will finance the essential exploratory work so necessary in investigating the possibilities of industrial expansion under the relatively crude conditions, industrially, that exist in most of the British Crown Colonies. Men with wide vision but limited capital have endeavoured to promote new ventures which have failed from one cause or another, but mainly through lack of experience and dwindling finances. We have had several failures in Fiji such as, for example, the Tova Meat Canning Industry, the small pineapple ventures of the early 1930's and, earlier still, the sisal industry. To-day, under proper organization, sound planning and sufficient capital backing, pineapple canning is likely to become an important addition to the industries of the Colony.

Failing private enterprise, it becomes the duty of Governments to take the lead in industrial development. The Crown Colonies, however, for obvious reasons, cannot expect to do much in this direction. Already in Fiji we have sought assistance from the Colonial Development Fund for the extension of much needed services and are not in a position, without further aid, to progress very far in industrial or agricultural development.

It is, therefore, with very great interest that we learn of a far-reaching and important new development in Colonial Policy. On June 25th, referring to such matters as have been raised in this editorial, the Secretary of State for the Colonies announced proposals to create a Colonial Development Corporation with a capital of £25,000,000.

As distinct from the Colonial Development Fund—which is concerned more particularly with improvement in social services, reconstruction and in general with the expansion of Government facilities—the Colonial Development Corporation aims at the development of worthwhile enterprises and will work in close association with Colonial Governments and private enterprise. In essence, it aims to co-operate with private enterprise and the Colonial Government concerned in the rapid expansion of industries which show promise; and its activities will be on a strictly commercial basis.

The importance of this new development cannot be over-emphasized. It is a forward step of the first magnitude. Implicit in the proposals is the recognition that a rapid improvement in the standard of living of Colonial people can only come about if development is on a much greater scale than at present.

The Colonial Development Corporation is welcomed as a milestone in the relations between the mother country and the Colonies and we can look forward to the hope that our own agricultural policy will become something more than the reorganisation and expansion of a Government Department; capital will now be at hand to push ahead with ideas of agricultural and industrial development.

—W.J.B.

STAFF NOTES

Mr. W. J. Blackie, Deputy Director of Agriculture, returned from leave in New Zealand and resumed duty on the 18th November, 1947.

Mr. R. R. Mason was appointed Agricultural Officer with effect from the 12th October, 1947, but had not yet arrived in the Colony at the time of publication.

Mr. T. L. Mune went on leave on the 2nd November, 1947.

Miss Mary Green resigned with effect from the 1st December, 1947, in order to leave the Colony with her family.

Miss M. E. Exon was appointed Temporary Clerk with effect from the 1st December, 1947.

Mrs. I. E. Coulter, who on the 30th August, 1947, succeeded Mrs. M. O'Connor (*née* Garland-Matthews) as Assistant Editor and Librarian, resigned her post with effect from the 6th November, 1947, Mrs. M. C. Davidson, formerly a member of the Staff of the Department, being appointed to take her place with effect from the 10th November, 1947.

AGRICULTURAL AND OTHER INDUSTRIES IN FIJI—THE 1946 CENSUS

BY C. HARVEY, B.SC., (AGR.), A.I.C.T.A., M.L.C.

The Report of the 1946 Census, recently published by the Government Printer, Suva, will probably not be available to many members of the farming public and the opportunity is therefore taken of presenting for their information a summary of that part of the Report relating to the occupation of the population of Fiji in industries, and particularly the various agricultural industries.

A population census cannot be expected to yield information of the same value to the agriculturalist as an agricultural census. The accompanying tables throw some light on the comparative status of the major branches of the industry though there are obvious discrepancies arising from the fact that the census papers included only two questions with regard to occupation and industry; the majority of individuals engaged in agriculture answered in such a way that they can only be classed as " mixed farmers " or " mixed cultivators" without further sub-division according to the principal crop grown.

Table I shows the classification of the population (males only) of the Colony into various industrial groups with sub-classifications of the agricultural and pastoral group and of that part of the manufacturing group concerned with agricultural products.

From the totals by races in each industrial class it appears that only one European in seven is directly engaged in agriculture while for Fijians and Indians the proportions are two out of three and one out of two respectively; though a large proportion of Fijians and Indians engaged in other industries probably maintain agricultural holdings also.

The weakness of the agricultural sub-classification is at once apparent in the large Fijian groups, Mixed Cultivation and Mixed Farming; no doubt a large proportion of these are villagers engaged in copra and banana production in addition to their food crops. The numbers of those stated to be engaged in coconut planting are smaller than would be expected; however to these must be added the 82 Europeans and 280 Fijians classed under Manufacture: Copra making.

It is surprising to find no Indians describing themselves as being engaged in goat raising; it is a matter of common knowledge that many are so engaged, but they are presumably included in the Mixed Farming category. Although 10 Fijians and 14 Indians are classed as tobacco farmers, over a 1,000 have given their occupation as tobacco growers in the occupation tables (Table No. 37 of the Census Report).

In Table II those engaged in various sub-classes of agriculture and industry have been grouped together. From this table the conclusion may be drawn that between one-quarter and one-third of the total labour force available for agriculture is directly engaged in sugar cane production, including nearly half the Europeans. Between one-fifth and one-quarter of the Europeans are engaged in copra production but it is unsafe to attempt to draw any conclusions with regard to Fijians and Indians as so many of them grow other crops too, and have for this reason been included in one or other of the mixed crop sub-classes.

Table III sets out the numbers of Fijians and Indians who farm on their own account as compared with wage earners; the former category includes Fijian villagers. Only one Fijian in every 20 engaged in agricultural production is a wage-earner, and one Indian in eight. It is interesting to note that 30 Fijians undertake dairy farming on their own account and that 25 engage in cattle raising. There are more (397) in sugar cane planting than banana planting but without doubt a large number of these in the Mixed Cultivation class also raise bananas for sale.

The census inquiry also included questions on poultry maintained by householders. It is recorded in the Report that 24,160 households out of the Colony total of 46,704 kept poultry, the total number of birds, including young chickens, being 399,969. 773 households maintained flocks of 50 and over while 96 households maintained over a hundred.

—C.H.

TABLE I—NUMBER OF MALES ENGAGED IN INDUSTRY, BY RACES.

	Chinese.	Europeans and Euro-Others.	Fijians.	Indians.	Total.
I—Agricultural and Pastoral—					
Fruit and nut growing	5	3	63	10	81
Market gardening	126	13	1,055	271	1,465
Cattle raising	....	3	61	104	168
Dairy farming	3	44	87	299	433
Pig farming	3	1	14	10	28
Horse raising	....	....	5	5	10
Goat raising	....	1	1	....	2
Stud farming	....	....	3	8	11
Herd testing	1	....	5	9	15
Poultry farming	2	1	14	10	27
Sugar cane planting	1	36	543	9,881	10,461
Rubber planting	1	....	17	60	78
Banana planting	1	4	369	7	381
Pineapple planting	3	75	1,325	226	1,629
Coconut planting	2	114	1,119	118	1,353
Yaqona planting	13	5	1,653	143	1,814
Tea planting	....	3	....	....	3
Tobacco planting	....	....	10	14	24
Crop farming	63	55	3,854	7,317	11,289
Mixed farming	22	16	3,314	565	3,917
Mixed cultivation	7	18	8,930	173	9,128
Co-operative farming	....	....	98	....	98
Farming not otherwise defined	8	9	....	380	397
Government agricultural administration	....	10	31	19	60
Total agricultural and pastoral	261	411	22,571	19,629	42,872
II—Forestry	1	14	300	151	466
III—Fishing	22	32	234	55	343
IV—Mining and Quarrying	1	200	984	138	1,323
V—Manufacture—					
(*a*) Associated with agricultural products—					
Abattoirs	2	6	27	15	50
Meat freezing and preservation	....	4	12	14	30
Fish curing and preservation	2	9	15	2	28
Butter factories	....	6	1	53	60
Ghee making	....	2	21	44	67
Milling (including rice)	2	4	....	21	27
Sugar manufacture	9	374	959	2,249	3,591
Copra making	2	82	280	118	482
Pineapple canning	1	2	6	5	14
Tobacco, cigar and cigarette manufacture	....	1	....	8	9
Starch making	....	1	....	....	1
Coconut oil products	3	3	14	8	28
Soap making	....	2	37	11	50
Tallow refining, etc.	....	2	....	....	2
Candlenut oil products	....	1	6	....	7
Yaqona pounding	5	....	243	8	256
Total agricultural manufactures	26	499	1,621	2,556	4,702
(*b*) Other manufactures	158	454	474	1,479	2,565
Total manufactures	184	953	2,095	4,035	7,267
VI—Building and Construction	71	332	1,001	1,062	2,466

	Chinese.	Europeans and Euro-Others.	Fijians.	Indians.	Total.
VII—Transport and Communications	22	229	1,104	1,070	2,425
VIII—Commerce and Finance	601	306	559	1,619	3,085
IX—Other occupations (excluding dependants) ..	282	1,099	7,185	10,550	19,116
Grand total	1,445	3,576	36,033	38,309	79,363

TABLE II—NUMBER OF MALES ENGAGED IN PRINCIPAL AGRICULTURAL INDUSTRIES.

	Europeans.	Others.	Total.
Sugar cane planting	36	10,425	10,461
Sugar manufacture	374	3,217	3,591
	410	13,642	14,052
Coconut planting	114	1,239	1,353
Copra making	82	400	482
	196	1,639	1,835
All other crop farming	185	25,814	25,999
Mixed farming	16	3,901	3,917
Livestock raising, including dairying, butter and ghee manufacture, abattoirs, meat freezing	68	833	901
Other farming and agricultural industries	35	835	870
Total	910	46,664	47,574

TABLE III—NUMBER OF FIJIAN AND INDIAN MALES ENGAGED ON OWN ACCOUNT OR AS WAGE-EARNERS IN AGRICULTURAL PRODUCTION.

	Fijian.		Indian.	
	Own account, or family worker.	Wage earner.	Own account, or family worker.	Wage earner.
Fruit and nut growing	37	1	6	4
Market gardening	1,031	21	236	34
Cattle raising	25	34	50	45
Dairy farming	30	55	146	153
Pig farming	4	10	7	3
Horse raising	1	4	1	4
Goat raising	....	1	....	....
Stud farming	....	3	8	....
Herd testing	....	5	1	8
Poultry farming	8	6	7	3
Sugar cane planting	397	137	8,865	1,014
Rubber planting	2	15	3	57
Banana planting	348	19	5	2
Pineapple planting	1,146	179	74	152
Coconut planting	953	166	35	83
Yaqona planting	1,641	7	137	5
Tobacco planting	8	2	13	1
Crop farming	3,699	124	6,929	301
Mixed farming	3,249	53	503	62
Mixed cultivation	8,693	62	133	40
Co-operative farming	96	2	....	....
Farming not otherwise defined	....	....	248	130
Total	21,368	906	17,407	2,101

AGRICULTURAL NOTES

1. COFFEE

SEED.

Fully ripe cherries are picked and pulped by hand, the seed being mixed with wood ash and dried in shade.

NURSERIES.

Plant in beds, with six to nine inches between seeds, and half an inch deep. In dry weather shade should be provided by mulching the beds with grass. Germination takes place in about six weeks, after which the grass mulch should be replaced by shade of reeds or grass on a rough frame of sticks. Water regularly in dry weather.

PLANTING OUT.

The land, which must be well drained, is preferably marked out on the contour and holed three months before planting. Holes are dug 18" x 18" and 18" deep. They should be filled well up a month before planting with surface soil and rotted compost, if available. Planting distances recommended are 12' x 12' for *Liberica* and *Robusta*, and 9' x 9' for *Arabica* coffee. The seedlings should be planted carefully to avoid bending the top root. Plant to nursery level only. Undersized seedlings and those with twisted roots should be discarded.

SHADE.

This requirement is variable, according to local conditions. The essential is protection from drying winds, either by choice of sheltered valleys or planting of wind breaks (mangoes or other trees). *Arabica* usually does best under light shade, e.g. *Gliricidia*, *Leucaena glauca*, bananas, between the rows as temporary shade and *Albizzia* sp. or other leguminous tree at 45' spacing for permanent shade. This can often be achieved when clearing new land for planting by leaving suitable trees at approximately 45' intervals.

CULTIVATION.

Keep the plants free from tall weeds and more especially grasses. Ring weeding to a distance of 2' from the plants is sufficient for the first two years. A mulch of cut grass, weeds and banana trash is very beneficial. In high rainfall zones a leguminous cover crop may be planted. On sloping land care should be taken to align weed rows along the contours.

PRUNING.

The best practice under peasant farming conditions is to bend the stem down when it has reached a height of four to five feet, tying with string or fibre to a stake or stone. Several " suckers " will arise from the base and " back " of the main stem. Of these, two or three are selected, the rest being cut away. They are allowed to bear for two seasons and then either bent over in turn, or cut away, and replaced by a further succession of suckers from the base. Alternatively the plants may be cut back at a height of six feet and prevented from exceeding this. A profusion of secondary and tertiary growth follows but careful and regular pruning of these small branches is then required, otherwise yields will not be maintained.

PREPARATION.

Red ripe (or in the case of some varieties, yellow ripe) cherries are picked and may be treated in one of two ways:—

1. *Wet Method.*—The cherries are pulped (i.e. freed from skin and flesh) either by hand or in a pulper. The beans are then fermented in a clean box or cement tank for 24 to 48 hours, according to temperature, until a sample of beans washed in water is free from stickiness. The beans are then washed in water and dried in the sun. When dry, the beans may be freed from the loose white " parchment " either in a huller or by hand in a wooden mortar, or may be sold " in parchment ".

2. *Dry Method.*—The cherries are dried on mats, which are preferably raised from the ground, or on any suitable clean surface (corrugated iron, cement barbecue, etc.) until the bean itself (i.e. the kernel) is sufficiently dry as not to be marked easily by the finger nail. The cherries may then be hulled in a metal huller (a small one costs about 75s.) or in a wooden mortar,

and winnowed in a grain winnower or by means of tossing in flat baskets. This method takes longer as the whole cherries take some two weeks to dry out in wet weather, but requires less care and is therefore better suited to small cultivators. Broken beans and foreign matter should be picked out by hand before sale.

NOTE ON VARIETIES IN FIJI.

Liberica coffee, with the largest cherries, and large leaves, is commonly found on native and other holdings in Fiji. This type is of considerably less importance than *Arabica* or *Robusta* coffees on the world market but there is a local sale for it in Suva.

Arabica coffee (small pointed leaves, medium size cherry) is also found in Fiji. It produces the finest coffee of commerce but is a more delicate plant, with comparatively low yield. It is less suited to peasant cultivation than *Liberica* or *Robusta*.

Robusta. Large leaves, small cherries with little pulp. This species is uncommon in Fiji.

GENERAL.

Coffee planting may best be introduced to peasant farmers in the form of 10—50 trees planted around the compound or widely spread in new clearings, where the ground would be either mulched with house refuse or else inter-cropped with food crops. Coffee is unlikely to thrive planted out away from the house where it is likely to become overgrown with bush or grass.

2. IMPORTATION OF CITRUS FRUIT FROM AUSTRALIA

As a result of recent consultations with the Australian Authorities the Director of Agriculture Fiji has approved the importation of Citrus from the coastal districts of New South Wales to Fiji subject to the following conditions :—

1. All importations of Citrus to be subject to a permit issued by the Director of Agriculture, Suva, Fiji.

2. Periodic inspections by officers of the New South Wales Department of Agriculture each year during appropriate seasons to be made of citrus orchards and also of citrus orchards in adjoining districts of the coastal areas of New South Wales to determine whether Mediterranean fruit-fly (*Ceratitis capitata* Wied.) and Queensland fruit-fly (*Dacus ferrugineus* var. *tryoni* Frogg.) are present or not.

3. Consignments of Navel and Valencia oranges, " Emperor " mandarins and lemons only be permitted, subject to the following conditions:—

(*a*) Navels—months of June, July, August;
(*b*) Valencias—September, October, November;
(*c*) Mandarins " Emperor " variety only—June, July;
(*d*) Lemons—no seasonal restriction.

4. The fruit proposed to be exported to Fiji shall be grown in orchards certified to annually by the Department of Agriculture, Sydney, New South Wales, to be free from fruit-fly, and that fruit-fly is not known to exist within one mile of the said orchard. A certificate to this effect will be required after thorough inspection of every proposed exporting orchard by a thoroughly experienced Inspector or Inspectors of the Department of Agriculture, New South Wales.

5. A list of the names of the persons of certificated orchards, together with the location of such orchards, to be prepared each year. Only fruit from such orchards is to be permitted to be exported to Fiji. A certified copy of the list to be sent at the commencement of each citrus fruit season by the Under Secretary and Director of Agriculture, Sydney, New South Wales, to the Director of Agriculture, Suva, Fiji, who will also be notified of any cancellation or additions to the annual list.

6. In the event of fruit-fly being discovered in any consignment of fruit from a certificated orchard, the certificate issued in respect of that orchard and those issued in respect to orchards within one mile of any such infected orchard, shall be cancelled forthwith. A new certificate is not to be issued in respect of any such orchard during the current season in which infection was discovered.

7. The fruit to be graded and packed in and consigned direct from packing sheds in the district which are registered under the Commonwealth Customs Act, 1901–36, and the Commerce (Trade Descriptions) Act, 1905–33, as Export Establishments.

8. The fruit to be inspected during packing in Registered Export Establishments, with a final inspection immediately prior to loading on to overseas steamer.

9. The fruit shall be packed in clean new cases not previously used for any purpose. The name and address of the grower in whose orchard the fruit was grown to be legibly stamped or branded on each case.

10. A certificate to accompany each consignment of fruit showing that it was examined at the port of shipment and found to be free from fruit-fly or other disease; that no fruit-fly is known to exist within one mile of the orchard in which the fruit was grown; the grower holds a certificate from the Department to the effect that his orchard and orchards within a mile radius are clean, also that the fruit is packed in clean new cases not previously used for any purpose.

11. It is to be specifically understood that the above conditions are laid down on the understanding that the fruit-fly present in the coastal areas of New South Wales is almost exclusively the Queensland species (*D. ferrugineus* var. *tryoni* Frogg.). If it is shown from the periodic inspection of the New South Wales Department of Agriculture that the Mediterranean species (*Ceratitis capitata* Wied.) is increasing to what is considered a dangerous proportion, the matter of importation from the coastal areas will be reviewed.

12. All fruit imported will be subject to thorough inspection on arrival and if necessary will be repacked at the importer's expense (*vide* D/A Circular No. 11 of 6th October, 1947).

In commenting on the above arrangements the Under Secretary and Director of Agriculture, Sydney, New South Wales, states that the conditions can be complied with. He says further:—

> " We desire to express our appreciation of your action, and assure you that everything will be done by our officers to strictly comply with the proposed conditions, if same are approved.
>
> It is believed that the conditions will prevent the introduction of fruit-fly into Fiji and will assist you in obtaining further supplies of citrus fruits. The trade should also be of benefit to our growers of citrus fruits in the coastal districts." —B.E.V.P.

3. SISAL DECORTICATORS

Recently several inquiries from local residents have been received regarding the availability of suitable equipment for the processing of sisal hemp, which occurs in several localities in the Colony but which has not been exported for a great many years.

Consequently inquiries have been made in England and the following is a brief note on a large amount of very useful information provided by Messrs. Robey & Co. Ltd., of Lincoln, England, who are one of the oldest manufacturers of this type of machinery and who have supplied units to plantations all over the world. These machines are widely known as giving the maximum of efficiency and reliability.

Full descriptions of a wide range of machines have been supplied and may be consulted at the Department of Agriculture, Suva. The following notes draw attention to a few selected items which may be of interest to readers.

The manufacturers recommend that for an estate where the production is large the fully automatic " Superdecor " Decorticator is the most suitable. The capacity of this machine is about 18,000 leaves per hour and four tons of fibre a day is a good average.

For smaller duties, are offered the belt driven hand fed Raspadors with fabricated steel frames. These machines are readily moved from place to place—the most popular size is the No. 4 double drum Raspador, having drums 43 inches diameter by 16 inches wide giving five to six cwts. of fibre per ten-hour day.

Some specifications are as follows:—

Type No.	Size of drums (ins).	Leaves in 10 hours.	B.H.P. required.	No. of operators.
0 Single drum	43 × 6	2,000	2	1
1 Single drum	43 × 12	4,000	3	1
2 Double drum	43 × 12	8,000	6	2
3 Single drum	43 × 16	8,000	6	2
4 Double drum	43 × 16	15,000	9	4

Of the above No. 0 is regarded as suitable for experimental purposes and the smallest size recommended for general estate use is the 43" x 12" single drum Raspador, size No. 1—the present quoted price of which is £238 f.o.b. English port. Freight by direct steamer is £22.

Messrs. Robey & Co. Ltd. estimate that delivery of certain of these machines could be effected in nine months from the acceptance of order and have provided a price list of selected items. This information will be made available to anyone who is interested in the subject. —B.E.V.P.

4. IMPORTATION OF SEED POTATOES

In September, 1946, inquiries were made in Australia regarding the certification of seed potatoes with special reference to freedom from disease. As a result of information received from the New South Wales Department of Agriculture, all local firms normally interested in the importation of seed potatoes were advised by circular that they should arrange to obtain seed certified to have been grown in areas free from the disease and it was recommended that the Seed Potatoes New South Wales Growers' Co-operative Ltd., 2 Spring Street, Sydney, provided a suitable source.

Only one local importer acted upon this advice. Others preferred to continue the practice of importing uncertificated seed of an inferior quality for which no adequate inspection certificate could be obtained. This type of potato is eligible only for a general produce inspection certificate with no guarantee of reasonable freedom from disease. The one consignment of certificated seed was of excellent quality and grade far superior in every respect to any other seed imported during the year.

Consequently the Australian authorities were again approached for further advice which is as follows:—

"Certified seed potatoes are tubers from crops which field inspections by officers of the Department of Agriculture have shown to be reasonably free from virus diseases *Fusarium* wilt and off-type plants (less than three per cent of the plants affected with leaf-roll, rugose mosaic, witches broom, spotted wilt, *Fusarium* wilt and off-type plants combined). Before the blue certification label is attached to the bags by the Inspector of the Co-operative Potato Growers' Association, the tubers must be graded so that they are sound and apparently free from rots, insect injury, mechanical injury and reasonably free from scab (*Actinomyces scabies*) and black scurf (*Rhizoctonia solani*).

It is suggested that your importers negotiate only with the Seed Potatoes New South Wales Growers' Co-operative Ltd. 2 Spring Street, Sydney, for seed supplies and always specify certified seed. This quality of seed potatoes may be identified by the fact that the bags are sealed with a lead seal and that a blue certification tag is attached to each bag."

It is considered that in the interests of local growers importers should be asked to co-operate in this matter. The introduction of a poor grade of uncertificated seed can only result in an increasing incidence of disease in the field and disappointing crops.

Importers are reminded again that a permit to import seed potatoes should be applied for before orders are placed.

—C.H.

5. PRODUCE INSPECTION FEES

Up to the present the Produce Inspection Division has carried out the work of repacking imported fruit and produce, the condition of which has not complied with that required by regulations under the Noxious Weeds and Diseases of Plants Ordinance Section III. Recently a consignment of oranges reached Suva in such a condition that a thorough inspection and repacking was necessary. This occupied the entire Produce Inspection staff for three days and resulted in a loss of 33 per cent of the fruit which was badly infested with fruit rot and fruit-fly.

It has therefore been decided that the one shilling (1s.) repacking fee may be charged administratively under Regulation 6, page 1044, Volume V.

This figure becomes an insertion on the Inspector's Certificate provided at Schedule A of the Regulations.

The attention of importers will be drawn to this arrangement. —C.H.

6. COCONUTS AND COPRA SURVEY, NORTHERN DISTRICT, FIJI

During 1946 and 1947 a survey of the coconut areas of the Northern District* was compiled by the Agricultural Officer Northern, Mr. L. W. Harwood, and his staff. It is hoped to complete the survey for Lau, Lomaiviti, Kadavu and the Yasawas as opportunities permit.

Detailed information is available concerning acreage of mature and immature palms, actual production and calculated potential production, the condition of estates and village groves with respect to weeds, and the provision of copra drying equipment. These particulars are separately recorded for each individual estate and village grove, and can be brought up to date from time to time; in total they provide a more accurate assessment of the productive capacity of the industry than has at any previous time been available.

Total acreages and production for the three provinces of the Northern District are given below, estate and Fijian production being shown separately. The potential production of 25,565 tons, representing a possible increase of 5,206 tons over present actual production, is based on a conservative estimate of the wastage of nuts not collected; this is due, in the case of estates, to shortage of labour for both weeding and cutting out and, in the case of native groves, mainly to lack of incentive. It will be noted that approximately half the estate acreage is classed as "weedy", whereas the same proportion of the Fijian acreage is "very weedy". The full collection of nuts amongst the undergrowth of weeds and half-grown "varas" typical of the "very weedy" class is impracticable.

Table IV shows the type of drying equipment in operation and in Table V an attempt is made to estimate the quantity of copra produced by each type, based on the measured capacity of driers and vatas Few estates rely on only one type; many have some form of artificial drier in addition to vatas. It will be noted that although Fijian production amounts to 8,187 tons (Table III) there is drying equipment of only 1,772 tons capacity maintained in the villages. The bulk of this copra is sold to green copra buyers, who operate drying facilitates of a total capacity of 6,315 tons.

"Smokers" have increased in popularity during the period of keen demand and comparatively high prices, and their total capacity now amounts to nearly one third of the total production of copra. Although good copra can be produced in a well-constructed smoker efficiently operated, the majority of these contraptions turn out a very inferior product and the extension of their use appears to be a retrograde step.

—C.H.

[* Provinces of Macuata, Bua and Cakaudrove. Islands of Vanua Levu, Taveuni and others—Ed.]

TABLE I—ACREAGE OF COCONUTS, NORTHERN DISTRICT.

Acreage under coconuts.	Bua.	Macuata.	Cakaudrove.	Total
	acres.	acres.	acres.	acres.
Nuts in bearing (Fijian)	5,530	6,576	20,917	33,023
Not yet bearing (Fijian)	668	67	142	877
Nuts in bearing (Estates)	4,257	2,027	41,460	47,744
Not yet bearing (Estates)	613	70	1,295	1,978
Total (Fijian)	6,198	6,643	21,059	33,900
Total (Estate)	4,870	2,097	42,755	49,722
Total (bearing)	9,787	8,603	62,377	80,767
Total (not bearing)	1,281	137	1,437	2,855
Grand Total, Northern District	11,068	8,740	63,814	83,622

TABLE II—CONDITION OF COCONUT PLANTINGS, NORTHERN DISTRICT.

Condition of Plantation.	Bua.	Macuata.	Cakaudrove.	Total.
Clean (Fijian)	606	102	....	708
Weedy (Fijian)	1,787	2,097	8,357	12,241
Very weedy (Fijian)	3,805	4,444	12,702	20,951
Clean (Estates)	365	971	8,922	10,258
Weedy (Estates)	1,160	611	23,780	25,551
Very weedy (Estates)	3,345	515	10,053	13,913

TABLE III—PRODUCTION OF COPRA, NORTHERN DISTRICT.

Production of Copra.	Bua.	Macuata.	Cakaudrove.	Total.
	tons.	tons.	tons.	tons.
Actual production (Fijian)	1,299	1,610	5,278	8,187
Actual production (Estates)	813	517	10,842	12,172
Estimated potential production (Fijian) ..	1,632	1,789	6,077	9,498
Estimated potential production (Estates) ..	1,041	549	14,477	16,067
Shortfall (Fijian)	333	179	799	1,311
Shortfall (Estates)	228	32	3,635	3,895
Total actual production	2,112	2,127	16,120	20,359
Estimated total shortfall	561	211	4,434	5,206

TABLE IV—COPRA DRYING FACILITIES, NORTHERN DISTRICT.

Drying facilities.	Fijian towns or groups.	Estates.	Green Copra Buyers.	Total.
Kilns	....	18	....	18
Running vatas (sets)	....	64	28	92
Open vatas (sets)	25	75	77	177
Smokers	33	124	50	207
Cement floors	....	2	4	6
No facilities	206	44	1	251

TABLE V—ESTIMATED CAPACITY OF COPRA DRYING FACILITIES, NORTHERN DISTRICT.

Estimated tonnages dried by.	Fijian towns or groups.	Estates.	Green Copra Buyers.	Total.
Kilns	....	1,544	....	1,544
Running vatas	....	5,434	1,585	7,019
Open vatas	862	1,626	3,066	5,554
Smokers	910	3,634	1,510	6,054
Cement floors	....	34	154	188
Total	1,772	12,272	6,315	20,359

7. SOIL CONSERVATION

The general public should awake and take interest in the most important matter which merits serious consideration in the development of the country: that is, "Soil Conservation."

Soil erosion will become one of the Colony's major concerns in a few years to come.

Steep slopes have been cleared and cultivated and with improper methods of farming, gullying is taking place and soil erosion is becoming a problem and will presently be a menace to the farming community.

In the Sigatoka district eight farms have been contoured, where steep slopes have been cleared and cultivated. Hedges of pigeon pea and vetiver grass have been planted on the contour margins and should form a satisfactory demonstration for the adjacent farmers.

Farmers have very little idea of conserving soil, and those who seem to have a little understanding have erected bunds, but as these are not being put in according to the contour, they do not serve the purpose for which they are constructed. Inspections of farms have revealed that, in spite of bunds, soil erosion and gullying take place owing to improper methods of cultivation.

There are farms at Savusavu and Uciwai as well as Togobula, where erosion and gullying is taking place. Recent heavy rains caused heavy loss of soil; and slopes now carry deep drains with sub-soil eroded and carried down the valley to creeks and rivers, thence out to sea. It is impossible to replenish this soil. Continuous erosion and loss of soil on farms not only decreases the value of the land but reduces its productivity. The soil must be saved.

Each farmer, by his negligence, may cause great damage to his neighbour by allowing the excessive run-off water to run without any control and scour away soil. This is where co-operation is required and farmers should encourage their neighbours to have their farms contoured as well as their own to control soil erosion within the area.

Gullying and soil erosion are taking place in practically all farms from Cuvu onwards as far as Uciwai and unless farmers can be induced to adopt conservation methods, in time to come these farms will lose a very large proportion of sub-soil, as well as their fertility, and will be rendered useless for farming.

Farmers have been approached for soil conservation work but in many cases are reluctant to effect improvements on account of not having security of tenure. Furthermore, rumours are spreading amongst farmers that the Department of Agriculture will levy fees. These rumours are not true, as no fees have been or will be levied by the Department of Agriculture. Word is also going round that ploughing in a snake-like manner will have a detrimental effect on their bullocks.

It is necessary to point out that ploughing across the slope is much easier on the bullocks than ploughing up and down the slope. By ploughing across the slope a farmer not only makes ploughing easy for his bullocks but reduces and controls soil erosion; but by ploughing and planting up and down the slope he is not only being harder on his bullocks but is also creating a way for soil erosion.

Ploughing in a snake-like manner, or on a contour, is not at all hard on bullocks as even cattle when grazing on slopes or hills walk along the contour. They do not ascend straight up the hill nor do they descend straight down the hill, but they follow the contour. So let us reason for ourselves, if it is natural for cattle to follow the contour, this should prove that bullocks will have no greater hardship in ploughing along the contours.

Farmers who are interested should interview Pandit Ram Chandar Sharma of Veibua, Cuvu, who has found no hardship in ploughing along the contours; but that ploughing is much easier this way.

As contour farming is new to farmers in this country and as they are under the impression that the making of contour bunds will entail heavy expenditure, much propaganda work is required to stimulate interest amongst them.

Soil erosion is a problem in Fiji; but as "prevention is better than cure", steps should be taken on a large scale, as attention has now been drawn to the importance of the problem of soil conservation since 1937, when the needs for watchfulness to stem the progress of soil erosion and of education to stimulate farmers to practise sound methods of soil erosion were pointed out by Dr. Jack(1).

Again in 1939 attention was drawn to the effects of soil erosion, the chief measures adopted to control it and the need to put such measures into practice in Fiji(2).

In 1944 notes were published in this *Journal* with the object of awaking public interest so that an extensive campaign could be launched in soil erosion control methods(3).

It is therefore hoped that farmers will co-operate and study immediately the control methods advocated by the staff of the Department of Agriculture which will it is hoped, assist in some way to control soil erosion. —SILAS RAMJAN.

REFERENCES.

(1) Jack, Dr. H. W., 1937. *Agricultural Journal*, Fiji, Vol. 8, No. 4.
(2) Donald, D. A., and Ramjan, S., 1939. Ibid. Vol. 10, No. 1.
(3) Jack, Dr. H. W., 1944. Ibid. Vol. 15, No. 2.

8. NOXIOUS WEEDS CAMPAIGN TAILEVU AND SERUA

In order to assist those dairy farmers of the Tailevu district who make a practice of cutting solanum twice yearly, in November and May, a campaign was instituted to have solanum cut on all the occupied land of the dairying district by the 30th November. Hibiscus burr was included in the general direction to clear, in order to enforce its eradication on certain areas which have not been cut at all this year. The province of Serua was included so that these weeds might be dealt with in the dairying district of Navua, if required.

In the Navua district solanum is not much in evidence but dairy farmers in various parts were visited and warned to deal with any small infestations before they could become serious. The worst offenders in the district are Fijian dairy farmers who have allowed hibiscus burr to take charge and who have been the subject of reports and correspondence for years. On one European estate the progress made in ploughing land heavily infested with burr has been better than expected and the measures under way give promise of securing control. Two written notices to clear were issued in the Navua district, one to a Fijian dairy farmer, who has eventually complied with instructions, and one to an Indian farmer. Some 30 acres near Deuba village, farmed by a Fijian, have at last been cleared of hibiscus burr. It would appear that persistent worrying of these people on repeated visits is necessary to secure results.

In the Tailevu area the campaign was directed chiefly against solanum, which is in full flower during November, but a few small areas of Hibiscus burr, uncut this year, also received attention. On practically all European dairy farms these weeds are now kept under control and attention was directed to the few exceptions, to Indian occupiers and to certain areas of native land at Sawakasa and Burerua in the centre of the dairying district. Visits were made to all holdings where solanum was in evidence or suspected and the occupiers instructed to clear, while written notices to clear were issued to four occupiers early in the month.

An inspection carried out on the 4th December disclosed that the campaign has been reasonably successful. Where written notices had been issued the work had either been carried out or was well on the way to completion. One exception was an Indian dairy farmer who had cut a small area of less than five acres out of a total of some 50 acres requiring clearing. About ten other Indian farmers who had received verbal instructions were again visited and the work found to be nearing completion. It was found necessary, however, to issue written notices to five persons (one European, and four Indian farmers). Most of these were given until the 15th December to comply.

The most conspicuous failure is that of the Fijians of Sawakasa. A small amount of work has been done along the Lodoni road but barely a quarter of what is needed, and large areas of flowering solanum still grow up to the roadside. This is the worst stand of solanum remaining in the district.

—A.D.M.

ANIMAL HUSBANDRY NOTES

IMPROVED POULTRY MANAGEMENT

BY R. N. SANDERS, B.V.Sc.

There are long periods in the larger towns of the Colony when eggs and poultry are either unprocurable, or, when procurable, most expensive. This is a serious state of affairs in a community where a large proportion of the population is, to a great extent, dependent upon poultry and eggs for its sole source of animal protein.

The cause is poor poultry management. The industry is largely in the hands of peasant farmers, who, individually, breed poultry on a very small scale. They own a variety of nondescript birds which forage for themselves, and mostly roost in trees. The inevitable result is that egg production is very low for the greater part of the year. The obvious solution would appear to be to improve the type of bird he keeps. It is doubtful whether this would be advisable. The peasant type of bird, since it is very hardy, and has unrestricted range, feeds itself better and experiences less disease losses than the average improved type which is fenced, housed and fed. The improved type lacks the resistance to disease, ability to forage, sit and fend for its young compared with the nondescript type. Many instances in the field have been observed where improved types of poultry have failed under peasant farm conditions and the nondescript birds have been the only ones to survive. The blending of the two types by cross breeding may have possibilities but could only be advised if we were sure that the hardiness of the nondescript and the higher egg production in the improved were dominant features in the progeny. It is known that the improved types must be cared for properly. The bulk of our eggs are produced by subsistence farmers who have neither the capital, the desire, nor the ability to care for better class birds.

It is obvious that if eggs and poultry are to be produced more cheaply and in greater quantities within a short space of time, production must be in the hands of a different class of farmer. There are farmers in the Colony who have the ability to put into practice the technicalities associated with improved management, and the capital to invest in fencing, coops, houses, and fodder. It is for such people that these brief notes are intended. As a word of warning it may be added that many people have attempted and failed at improved poultry raising in Fiji. There are several causes for these failures which are avoidable and so should not deter others. Usually a person with no or limited knowledge has started up in a big way rather than start in a small way and gradually build up the flock as his knowledge advanced. This would necessitate having sufficient capital to carry him over two or three years until reaching full production. Others have kept their flocks too small and their returns have been insufficient to recompense them for their outlay on materials and fodder. If one takes fencing costs alone, one standard roll of wire netting gives sufficient space to confine 20 birds under the semi-intensive method. This, at present rates, is equivalent to 5s. 6d. per bird. On the same basis two rolls of netting give sufficient space for 83 birds or just over 2s. 7d. per bird. It is clear that fencing, housing, and feeding costs per bird will decrease proportionately the larger the flock. In addition, past failures have been due to haphazard management; eggs are set at any time of the year; insufficient care is given to chickens; attempts at disease control are initiated after rather than before losses occur. Because of heavy chicken losses, replacements have been dependent upon all survivors being taken into the flock irrespective of type. Frequently, there have been insufficient replacements, necessitating the retention of old birds long past the peak of their production. In spite of heavy outlay on fences, etc., the inevitable result is few, if any, more eggs per bird than the peasant farmer obtains with no outlay. Further, the eggs are not produced during the off season but during the short

glut season when they are unable to compete in price with the ordinary peasant farmer's eggs. If any farmer intends to outlay money on poultry farming he must have a flock big enough to give him a return for his outlay, must rear sufficient pullets to permit of heavy culling of old and inferior types, must hatch his young stock at such a time that they will give him eggs during the off season and bring his surplus cockerels to the killing stage at the most profitable time of the year between Christmas and Easter.

Breeds.—Australorp, Rhode Island Red, and White Leghorn, are the most common of the improved breeds that have been tried locally. The Australorp is the most popular of these, being a good utility bird. The Rhode Island Red is probably a better producer, but some owners have experienced far heavier disease losses with this breed. The White Leghorn, in other countries, is supreme for egg production though an inferior table bird. The limited local experience with this breed indicates that it should do well here. Since it is white and close feathered it should be less affected by tropical conditions than the black loose feathered Australorp, which, since it is lower slung, has its underline wet most of the wet season.

Egg laying trials conducted in Queensland reveal that the Australorp lays more eggs than the White Leghorn during the first year, though over a two-year period the latter is the better of the two. Some successful Queensland poultry farmers claim that it pays them to breed Australorps and sell them as killers as soon as they go into their first moult (about 21 months old). They base this claim on the fact that the cost of hatching and rearing the birds is more than offset by the gain in egg production per bird, increased price for young killers, and not having to feed non-producers during the moult. The White Leghorn breeder keeps his layers until they are about 32 months old and just going into the second moult by which stage there is too little margin between eggs produced and cost of maintenance. As killers they bring a lower price both because they are older and the breed is inferior for table purposes. It should be borne in mind that the successful Queensland farmer, in spite of similar climate, has cut his chicken losses considerably lower than those in Fiji. Until local farmers can do likewise the selling of layers at 21 months old and replacing them with pullets would not be economic. Further, there is no higher price for prime killers in Fiji. Preliminary observations at the Department's Livestock Farm, Sigatoka, this year reveal that under local conditions the Australorp lays a little heavier than the White Leghorn. The Australorps consisted of a great majority of aged birds while the Leghorns were all pullets. The following is the comparative production of the three breeds kept at the station during the peak production month of September this year.

Breed.	Average eggs per bird for month.	Average eggs per bird per day during month.
Rhode Island Red ..	18·9	0·63
Australorp	11·43	0·38
White Leghorn ..	11·18	0·37

These figures give some idea of what farmers may expect from the different breeds under conditions in Fiji.

Breeding.—The breeding stock must be carefully selected and inferior type birds heavily culled. Although high production must be the aim of breeding, breeders should only be selected from stock which produces the highest percentage of fertile and hatchable eggs. Progeny from low producers whose eggs were either lowly fertile or gave poor hatching figures should never be placed in a breeding pen. High producers cost no more to maintain than low producers. Two year old hens produce 20 per cent fewer eggs than yearlings. Four year old hens lay 30 per cent less eggs than yearlings. As stated above, North Queensland farmers find that it does not pay to feed and house Australorps over 21 months old and White Leghorns over 32 months old. The only exception to this is when birds proven for high production, fertility, hatchability, and resistance to disease are kept for special breeding purposes.

After all old, deformed, and poor type stock have been culled, the next consideration is to cull out low producers. The

average local farmer would find trap-nesting beyond his means, but he has other means at his disposal. Observations at the Department's Livestock Farm show that the peak of local egg production is reached between August and September. Any bird not laying at this period should be culled as a low producer as all birds worthy of retention will be laying at this stage. Broodiness is associated with low production and for this reason any bird with a tendency to frequent broodiness must be culled. Low producers also go into an early moult so that any bird moulting in March must also be eliminated. The breeders for the coming season may now be selected from the better type remaining birds. Culling and selection in this manner will bring about a gradual rise in flock production for the same amount of outlay on feeding and housing. A quicker and more certain method is to breed from birds with a known factor for high production. This is no doubt beyond the means of most local farmers though it is a popular practice on overseas farms. The best plan for the local farmer would be to endeavour to obtain sires from proven stock. At present there are none available in Fiji though it is hoped that they will be available from the Department's farm at a later date.

Before the hatch commences the farmer must work out how many breeding birds he will require. This is a common fault with poultry production in Fiji. Little or no consideration is given to the requirements for the following year and those who wish to cull find that they have insufficient replacements. As a guide to the progress of the farm the owner must keep proper records. These records should indicate the average egg production per bird for any period during the year, percentage of fertile eggs, hatchability, and losses during rearing. If these records are available it is but a simple calculation, knowing the replacements required, to ascertain the numbers of breeders that will have to be kept. Since half of the hatch will be cockerels the figure for replacements will have to be doubled. Allowances are then made for the percentage of losses to be expected between hatching and maturity, percentage of eggs that are not suitable for setting. This gives the number of eggs required over the nine week hatching season. Divide this by the average number of eggs per bird that can be expected over this period and the result gives the number of breeders that will have to be kept.

Sires should not be over 18 months old. Two year olds, particularly in the heavy breeds, frequently lack the vigour necessary to produce a high percentage of fertile eggs. This has been found to be particularly true in North Queensland. Fertile eggs can be obtained as early as 24 hours after mating, but maximum fertility is not attained until the cockerels have been running with the hens for at least two weeks. The number of hens to a cockerel varies with the individual. Light breeds (White Leghorn) can cover a larger number (12 to 15) of females than the heavy breeds (Australorp). The proportion of males to females in Australorps is usually one to six or eight hens. This is the popular proportion in Fiji though a young virile cockerel may be mated with up to ten hens with safety. One cockerel for every 15 females is sufficient in the case of mass matings. Cockerels and hens have decided likes and dislikes and one frequent cause for infertile eggs is a cockerel that will not mate with certain females. Thus it is a good practice to change cockerels around from pen to pen regularly.

Incubation.—The best time to hatch in the southern hemisphere is between July and September. This produces pullets which if properly managed, will start to lay in February or March and continue to lay through the period when the hens go into a moult and cease laying. If this is followed eggs will be available for sale at the most profitable time of the year, that is April to June when most consumers find it impossible to obtain eggs. This will also provide surplus cockerels for sale between Christmas and Easter. Pullets which lay through the moulting season may cease to lay for a very short period at the end of June and then continue to lay until the following April, when, as hens, they will go into a moult. Chickens hatched before July tend to moult with the hens the following April. Chickens hatched after September seldom commence to lay until the end of June.

The method of incubation, either natural or artificial, will depend upon the size of the

farm. Small farms are well advised to rely on the broody hen. A bigger percentage of hatch is obtained by the natural means, but the time of setting is dependant on a broody hen being available. This may not be during the correct season to hatch eggs to obtain pullets that will lay during the moulting season as there should be few or no broody hens on a well managed property. This can be overcome by keeping several old hens of the unimproved types especially for this purpose. The household flock owner can afford to set individual hens and raise each batch of chicks separately. The owner on a commercial basis cannot afford to do this and in order to economise on handling and prevent heavy disease losses he will be forced to set batteries of hens and group their chickens together in a coop after hatching. The commercial farmer has also to consider that all his hatch must be completed within a nine week period between July and September. A large cool shed is the best place to set hens. If possible it should be rat-proof and have an earth floor. The nests may be made either on the floor or in boxes containing some moist soil. The nests should be secluded. Prior to setting the hens must be treated for lice and other vermin, otherwise they will become restless and may break eggs or even leave the nest. Thirteen eggs are the normal setting for a hen though heavy hens can cover fifteen adequately. The eggs should be placed around the hollowed nest with the small end facing the centre.

Eggs for setting should be as fresh as possible and not over eight days old. Care must be taken that they are not jarred during collection and storage. When eggs have to be stored for a few days they should be kept on their sides in a cool place. The best eggs for setting weigh two ounces. Eggs much under or over this weight seldom give good results. All misshaped eggs, either too round or elongated, as well as those with cracked or uneven surfaces, should be discarded. The hen may not leave the nest for three or four days. If she has not come off after four days, she should be carefully lifted off and given food, water, and exercise. Adequate fresh supplies of food and water must always be available to the sitting hen. Never feed her sloppy foods. Provided the eggs were fertile and from robust birds, they should start to hatch out around the twentieth day. Once the eggs have commenced to chip never interfere with either the hen or her eggs.

As stated above, the person dependent upon hens becoming broody cannot control the time of his hatch. The owner of an incubator can do this. However, the farm must be big enough to support an incubator; these are available in sizes from 50-egg to over 20,000-egg capacity. The efficiency of an incubator increases with its size. Since the hatching season should not exceed nine weeks, the possessor of a single machine can expect no more than three hatches during the season. Under average local conditions 80 hens would supply sufficient eggs of the proper type to fill a 100-egg capacity machine in one week. At least a 70 per cent hatch may be expected, thus giving 210 chicks hatched for the season. If the subsequent chicken losses are no more than 10 per cent, and allowing for 50 per cent cockerals, 94 pullets or sufficient for culling and replacements, may be expected. However, chicken losses on many farms in Fiji exceed 50 per cent. If the farmer is unable to reduce such losses he would have to invest in more than one incubator in order to obtain sufficient replacement pullets.

Brooding.—Heavy losses of chickens during the first week after hatching are so common in Fiji as to be frequently accepted as inevitable under local conditions. Experience at the Departmental Livestock Farm shows that these losses can be reduced to one per cent and less. Contrary to popular local belief, chickens, at least during the first week, require more warmth than is provided by local atmospheric temperatures. These losses are frequently due to the chickens being cold. When cold chickens huddle together, many are injured by trampling, and others are suffocated. North Queensland farmers claim that their chicken losses are halved when they use heated brooders. The procedure at the Livestock Farm is to place chickens under a kerosene heated brooder for the first week. The amount of heat is gradually reduced until the last night, when they are under an unheated brooder. The chickens are then

removed to a coop where they remain until they are six weeks old. The coop is constructed to prevent the transmission of coccidiosis, a serious disease of young chickens. The floor is made of heavy gauge half-inch mesh wire netting supported on strands of plain fencing wire. This floor is scrubbed thoroughly at least once a day. The coop is built on legs which permits the droppings to fall through to the ground. The chickens are then unable to pick at infected droppings and so contract coccidiosis. The coop is placed out in the open as much as possible but is protected from rain, cold wind, and excess heat. At night the coop is placed in a warm protected shed.

Care should be taken to see that chickens are not over-crowded in these coops and due allowance must be made for their rapid growth. Properly cared-for chickens will double their hatching weight within two weeks. Overcrowding with insufficient feeding and watering space is responsible for many chicken losses and retarded growth. Profitable egg production is associated with early maturity and well grown chickens. White Leghorn chickens which do not have their tail feathers within ten days of hatching are seldom good producers and should be culled at this stage.

Rearing.—At six weeks old the chickens may be moved to rearing yards as they will have passed the most susceptible age for coccidiosis. From this period until they are almost fully grown sundry troubles such as internal parasites, coryza, etc., may be expected. These troubles are less prevalent during the drier months and in well grown stock. Thus chickens hatched between July and September have an additional advantage over those hatched at any other time of the year as they are well advanced and past the most susceptible stage by the time the wet season commences. Nevertheless no risks should be taken and the chickens must be placed in clean yards. American authorities do not consider any yard clean if it has had poultry in it during the previous two years. The wet, humid conditions of Fiji, which are ideal for the persistence of parasite eggs and larvæ, may require longer periods of rest for rearing pens. When the Department raised poultry at Nasinu, parasite losses, while not eliminated, were considerably reduced by providing ample clean lawn space for chickens at the rearing age. The yards were rested only between hatching seasons. It is felt that the latter method is preferable to the former in view of the high landed cost of materials. The former method requires three times the actual rearing space needed, each section to be used only once in every three years. The rearing area should be well away from the main flock and no mature bird should be permitted on it. The run should provide at least 100 square feet of space for each growing bird. On this basis two standard rolls of wire netting would provide an area big enough to run fifty growing birds.

The rearing house should be built so that all drainage is away from it. A maximum of ventilation without creating draughts and exposing chickens to the weather is essential. A house 12 feet by 6 feet is large enough to accommodate 50 half-grown birds. An excellent type of rearing house for the hot conditions of Fiji is tent-shaped, 12 feet by 8 feet, side walls 3 feet high, ridge pole 6 feet high. The walls are not boarded but covered with wire netting. Protection from the weather is provided by the roof with an overhang of two feet all around. Perches are fitted on both sides of the house which is large enough to house 80 to 100 young birds. This type of house has been most successful at the Department's Sigatoka Farm. Adequate shade in addition to the house is necessary. This is best provided by shrubs and trees. Feed and watering troughs should be moved to fresh areas frequently enough to prevent bare patches from forming as these areas become grossly contaminated.

At the rearing age the sexes should be separated. The owner has then to decide what to do with the young cockerels surplus to the requirements for the following year. The absence of a local demand for prime table birds makes it impossible to feed them on the same scale as the pullets. Local prices improve a little towards Christmas and Easter. The more advanced of the July–September hatched cockerels would be ready for the Christmas trade and the

balance would be ready by Easter. If cockerels cannot be sold at better prices during these two periods, they are hardly worth the expense of rearing. In such circumstances it would only be economic to let them take their chances on the local poor quality rice bran and skim milk, if available in sufficient quantities.

It is advisable to teach chickens to roost as early as possible and special platforms to facilitate this can be built in the rearing house.

Mature.—The pullets may be considered ready for the main flock at five or six months old. If deformed and unthrifty birds have not been culled previously, culling must be completed at this stage.

There are three methods of farming poultry that may be adopted in Fiji, range, semi-intensive, and intensive. The range method is not recommended on islands where there are mongoose as egg losses would be too heavy. Combination wire netting is not successful against mongoose as they soon learn to climb over the finer mesh.

Mongoose can be controlled more economically under the semi-intensive system provided an area around the pens is kept free from tall grass and weeds, traps are set, and a good mongoose dog is available. Locally the semi-intensive system is the most popular for this reason. However, since the space permitted the birds is restricted as compared with the range system, the yard soon becomes bare and badly contaminated. At least one poultry farm in Fiji overcomes this by having two pens which are used alternately with one house. Although this doubles fencing costs and space requirements, it is recommended as a good and profitable form of management. Good results have been experienced with this method in the U.S.A. Semi-intensive pens should be large enough to give 60 square feet per bird. There is much variation in the type of house constructed for this system. A house 30 feet long by six feet wide, five feet high at the back and six feet at the front, fitted with two perches, is large enough to accommodate 100 hens. Modifications of this can be made for smaller flocks as long as the farmer remembers that the housing cost per bird increases with the smaller houses.

The intensive system is not used in Fiji Under this system the birds are confined to a house all the time. North Queensland poultry farmers are particularly enthusiastic about this method, which, they claim, practically eliminates parasitic losses and greatly reduces labour costs. There are many types of houses that can be used but the types commonly recommended for temperate climates are likely to fail under local conditions unless modifications for extra ventilation are provided. A common type in North Queensland is a long house 15 feet wide. Dividing walls are put in every seven feet six inches along its length to form a row of pens, each pen holds up to 25 White Leghorns. Fowls must have plenty of exercise if they are to remain healthy. In order to provide this exercise in the intensive house a good supply of litter is kept on the floor.

Feeding.—This is the biggest problem associated with poultry production in Fiji. Wheat and wheat products form the ideal basis for any poultry food. These products, as with other imported foodstuffs, are now either unobtainable or prohibitive in price. The only foodstuffs in ample supply at the moment are coconut meal, rice bran, and skim milk. Although coconut meal has the proper protein requirements for laying birds, it has a relatively high proportion of fat, which, if fed alone, tends to set up digestive troubles and makes the bird overfat. The addition of crude rice bran makes a palatable and more suitable mixture but brings down the protein content to well below requirement. Skim milk is an ideal poultry food and an excellent source of protein. For this reason any farmer contemplating poultry production should run cows. The ghee made from the milk provides an added source of income and the skim milk forms a profitable food for the birds.

The following mixture, while far from satisfactory in many respects, is being used as an interim mash on the Departmental Farm for growing and adult birds until either imported foodstuffs become available at more reasonable prices or there are

sufficient supplies of locally grown grain sorghum.

Coconut meal	60 parts
Rice bran	16 ,,
Meat meal	10 ,,
Bone meal	10 ,,
Fine salt	4 ,,

The above is mixed with skim milk to form a moist friable mash and is fed in the morning. Fine-chopped soft grass is fed at noon and cracked corn in the evening. Skim milk is always available for drinking.

The following mixture is suggested where adequate supplies of either grain sorghum or maize are available.

Coconut meal	28 parts
Meat meal	20 ,,
Rice bran	38 ,,
Cracked grain sorghum ..	14 ,,
Bone meal	10 ,,
Fine salt	4 ,,

The cracked grain sorghum may be replaced by maize meal and either grain sorghum or cracked corn is fed in the afternoon.

Where fresh green grass is not available two per cent cod liver oil must be added to the mash.

Chickens should not be fed for the first 36 hours after hatching though clean water and fine grit must be available. After this, oatmeal or bran, which is moistened sufficiently with skim milk to prevent dusting, is fed for the next few days. Gradually a little cracked corn is added until there are equal parts of bran and corn. Skim milk is always available for drinking. It is considered advisable at this stage to bring the chicks on to imported growing mashes in the morning and fine cracked corn in the evening and to keep them on this diet until they are six weeks old. Though expensive the imported food gives far superior growth and development at this vital stage. After the chickens are more than six weeks old they should be gradually brought on to one of the above mashes.

The principles of management briefly described above will, if properly applied, eliminate low producing birds and give the farmer eggs through the moulting season. Surplus cockerels will be available at the most profitable time of the year.

TRACTOR PRODUCTION IN UNITED KINGDOM

It may be poor consolation to farmers who are at the present time unable to obtain the tractors they require to know that the manufacture of tractors in the United Kingdom is expanding rapidly, but the following account of the industry drawn from the editorial notes of the *Farm Implement and Machinery Review*[1] indicates the great strides that are being made.

The average yearly British tractor production between 1934 and 1938 was 15,000. This was more than doubled in 1945–46 and reached 60,000 in 1946–47, while in 1947–48 this figure was expected to have again more than doubled. The target for 1950–51 is 275,000 tractors. The export targets are, for the four years 1948 to 1951, 47,000, 135,000, 185,000 and 200,000 tractors respectively, i.e. at the peak production of 275,000 tractors only 75,750 are estimated to be required for the home market.

The tractors in manufacture at the present time include crawler types although wheel tractors account for the largest proportion, and the International Harvester Company is to manufacture the popular "Farmall -H" tractor in the United Kingdom.

An Agricultural Officer (Mr. ffrench Mullen) has been looking into the tractor position while on leave in the United Kingdom with special reference to the likely suitability of British tractors for Fiji conditions. It is hoped to publish notes by Mr. ffrench Mullen in a forthcoming issue of the *Journal*.

—C.H.

REFERENCE.

(1) *Farm Implement and Machinery Review*, Vol. 73, No. 873.

CHEMISTRY NOTES

"SOIL SCIENCE IN FIJI"—PART II

THE EXAMINATION OF SOILS

BY L. E. SMYTHE, M.Sc., A.R.I.C., A.A.C.I.

Our world is so complex that it would be difficult to understand it at all, unless we classified like things together. Soils are examined and classified just as are plants, minerals and many thousands of other things. This passion of man for classification constitutes one of his most important activities and aims at a more complete understanding of the world in which he lives.

The soil scientist examines soils in the field and in the laboratory with a view to the elucidation of vital information regarding the particular soils with which the agriculturalist has to deal. It is important that to-day's agriculture has at its disposal accurate information concerning the physical and chemical properties of soils and the distribution of the defined soil types. This, because of the realisation that the ancient picture of farming has been altered by economic considerations.

A certain Mr. Farmer, who obtains only one half of the expected yield of potatoes per acre, while suffering a personal loss may or may not realize that his loss, small or large, is also of importance in the overall picture of economy in agricultural production. Decreased yields or production may involve many factors such as soil, climate, disease or management. The more complete the agriculturalist's knowledge be, regarding such factors, the easier is the solution to the problem. In many cases it is also difficult for the inexperienced to distinguish between the symptoms of a nutrient deficiency and those of organic diseases. If there are available ample details concerning the nutrient status of a particular soil, it is unlikely that "leaf scorch" of tobacco leaves, indicating "potassium hunger", would be confused with a virus disease or the effect of insects.

Record has it that some 4,000 years ago the Chinese(1) developed a classification of soils on the basis of colour and structure. However, until comparatively recently, progress in the field of soil science has been rather piecemeal and has followed the general pattern of agriculture.

It may be taken that the examination of soils from the modern viewpoint and important field experimentation in soil science, commenced in the early 1830's. An important landmark in the early history of soil science was the establishment of the famous English Rothamsted Experimental Station in 1843. At this time Justus von Liebig, the German scientist, had put an end to the alchemistic theories of plant growth. The early theories had done more to retard soil science than to advance it and failed to recognize the dynamic nature of the soil, promoting the misconception that the soil was a static store house.

About 1870, however, a brilliant school of soil science sprang up in Russia under the leadership of Dokuchaiev, who was followed by such workers as Siebertsev, Glinka, and others. Rather than study specimens of soil in the laboratory, Russian scientists first studied soils in the field and supplemented their observations with laboratory data. The idea of definite "soil profiles" developed, and five principal factors were recognized as chiefly contributing to the properties of a soil. These were:—

(i) Climate;
(ii) Vegetation;
(iii) Relief;
(iv) Parent Rock;
(v) Age.

From this stage onward we have the development of schools of soil science in the principal agricultural areas of the world.

The soil type as defined by the modern scientist is representative of the combined forces and factors which produce the medium in which the plant grows. Fundamental soil types are described, classified

and, together with the experimental data, form the basis of a system of land classification for land-use planning.

An important prerequisite to the laboratory examination of any soil and in soil survey, is the examination and collection of soil samples in the field. The modern technique of soil survey and soil testing requires careful attention to sampling methods and the recording of conditions *in situ*. The examination of the soil profile, likewise requiring careful study, is a matter for the experienced soil scientist who is able to appreciate the significance of profile variations.

The selection and collection of soil samples is of great importance, if the laboratory data are to be of any value. In many countries a great deal of time consuming laboratory work is often devoted to soil samples which may be as representative of the particular area, as Serua would be of the whole of Fiji!

The methods of soil sampling will be set out in order to guide those with a particular soil problem requiring investigation. It should be pointed out however, that wherever possible, soil sampling should be carried out by the Chemist attached to the department's staff. In addition, facilities for the examination of soils are strictly limited and staff insufficient to meet the demands of a greatly increased soil testing service. The highly developed and efficient soil testing and extension services of larger agricultural areas require considerable finance, ample technical staff and adequate facilities for such work.

The standard soil sample cards now in use by this department require fairly complete information concerning the location and history of the soil sample. There is provision on the cards for the recording of technical data and in addition, the following:

1. Date of collection of sample—1/11/47.
2. Reference number—sample A.
3. Official number—797.
4. Collected by—J. Farmer.
5. District—Suva.
6. Province—Rewa.
7. Portion—Tamavua.
8. Section—Surface.
9. Depth—0 to 10".
10. Exact Location—area between "By-Pass" and Waimanu Roads at Tamavua Junction.
11. Map Reference—Aerial map of Suva, 1: 12,672, as marked.
12. Geographical Landscape—steep hills.
13. Elevation—100 feet.
14. Climate—wet tropical; rainfall 120".
15. Geology—marl, Rewa Series.
16. Native Vegetation—nil, cleared.
17. Drainage—impeded.
18. Crop Information—no fertilizer applications; native gardens on Forest Reserve.
19. Soil Type—black clay loam.

The soil scientist is able to define accurately all the above, and this is why it is preferred that the soil samples be taken by an experienced person. Samples submitted by other persons should include as many of the above details as is possible. For example, samples of the typical rock found in the area, or specimens of vegetation, may be forwarded with the soil sample where the name is not known.

The soil scientist takes a great deal into account when selecting a soil sample for determination of physical characteristics and nutrient status, or in the course of a soil survey. Soils may be examined and sampled by—

(i) digging a special soil pit for profile samples;
(ii) taking samples with the aid of a special soil auger (similar to a post-hole auger); and
(iii) using a spade for the collection of surface samples (e.g. 0 to 10").

It is not intended to describe the methods employed in (i) and (ii) above as, generally, the inexperienced person would use method (iii). The taking of a sample to represent the top 0 to 10" is useful for any examination of the nutrient status of the soil. Plough depth is usually about eight inches and, in addition, the majority of plant roots are concentrated in this surface layer—even though some plant roots may penetrate the soil more than ten feet.

The following notes are intended to guide those taking soil samples.

(1) Requirements: one garden spade; one knife for clearing vegetative cover;

a piece of canvas or sacking about three feet square; 2 lb screw top jars or 2 lb tins with tightly fitting lids; labels for attaching to containers (for reference numbers).

(2) Walk over and inspect most of the field or area it is intended that the sample be representative of.

(3) Do not try to sample so as to include all soil types in the one sample.

(4) Carefully choose the sites for taking three samples representative of the area or, of one soil type, if there are several soil types in the area.

(5) In selecting the sites, take into consideration ground cover, micro-relief, degree of erosion, surface drainage, proximity to trees (if in open country) and all other factors likely to affect the soil in comparison with the normal type it is intended to represent.

(6) Record the details necessary for the soil sample cards as mentioned above, and mark the position of the soil sample sites on a rough sketch map of the field or area; this map should be forwarded with the soil sample.

(7) Clear the vegetative cover over the sample site and, with the spade, carefully remove the surface layer to a depth of not more than half an inch, over an area of one square foot. This top half inch may be discarded, in the case of samples taken by inexperienced persons.

(8) Dig out the soil to a depth of approximately ten inches and carefully place all the soil from the hole on the sheet of canvas—breaking up the large lumps of soil.

(9) Repeat, for the other two sites and add the soil from these holes to the soil already on the canvas.

(10) Mix the soil thoroughly on the canvas, spread out to a layer some two to three inches deep and take " grab samples " at random until 2 lb of soil is obtained. This composite sample is placed in the container and the soil remaining on the canvas is discarded. The container is labelled, numbered and the date of sampling is recorded. It is also advisable to place the soil sample number on a slip of paper and place inside the container with the soil.

(11) Forward the sample to:

The Director of Agriculture,
Suva, Fiji.

with a covering letter giving complete details regarding the sample and the reason(s) as to why the examination is required. For instance, the examination may be required in connexion with a proposed vegetable growing programme, pasture improvement or crop failure.

From the above, it will no doubt be appreciated that wherever possible the services of an experienced officer will obviate the necessity for the person concerned, to familiarise himself thoroughly with the methods of soil sampling. However, intelligent application of the above principles will provide all that is required, from the sampling viewpoint, for the examination of the nutrient status of a soil in the laboratories of the department.

REFERENCE.

(1) Thorp, J., 1936. " Geography of the Soils of China ", 552 pp., illus., Nanking.

COCONUT INDUSTRY

EXTRACT FROM " THE CROWN COLONIST " OF OCTOBER, 1947, PAGE 563

In his speech opening the Coconut Conference, held at Colombo, Mr. D. S. Senanayake, Minister of Agriculture and Lands, said that coconut products were at present fetching comparatively high prices, owing to the world shortage of fats and oils, but there had been an alarming decline in the volume of production in Ceylon. Exports of coconut products which in 1944 totalled, in terms of copra, over 176,000 tons, fell in 1946 to only 97,000 tons, and the figure for 1947 was likely to be even lower. The decline was mainly due to years of neglect of cultivation, manuring and replanting. The producer could hardly be blamed for this, because the prices prevailing since the last depression left him no margin.

AGRICULTURE IN THE SOUTH PACIFIC

The following notes on the progress of agriculture in other Pacific territories are extracted from annual reports for the year ending 31st March, 1947.

1. TERRITORY OF WESTERN SAMOA.(1)

Agricultural services consist of—

(*a*) Inspection of all produce for export in order to maintain good marketable standards, and of land near the Port of Apia, principally to check the breeding of the rhinoceros beetle (*Oryctes nasicornis*), pest of the coconut-trees, which was introduced during the period of German administration. These services are under European supervision.

(*b*) Fourteen Samoan Plantation Inspectors, who are elected as part of the system of Samoan elective officials, and whose duty it is to encourage care of Samoan cultivations and new plantings.

There has not been any evidence that the scoliid wasp, *Scolia ruficornis*, which was mentioned in last year's report as having been introduced to combat the rhinoceros beetle, has become established.

2. COOK ISLANDS.(2)

Progress towards the re-establishment of the citrus industry continues to be maintained. Eighty-four plots have been established under the orange replanting scheme; the majority of these plots are of ninety trees planted in one and a half acres of land, a few are smaller owing to the smaller area available. One plot is ready for planting, and applications for twenty-nine other plots have been finalized. On the whole, the plots are doing exceptionally well and the young trees are well advanced for the length of time they have been planted.

During the year 8,700 budded orange-trees were distributed; in addition, there are 730 young budded trees now ready for distribution, and a further 1,500 plants are ready for budding now and will be available for distribution in November, 1947. There are also 20,000 seedlings which have been recently transplanted, and 40,000 seedlings yet to be transplanted.

The citrus replanting scheme has been extended to Aitutaki, and some 2,100 budded orange-trees have been planted out in plots. The citrus nursery at Aitutaki has been restocked with seedlings sent from Rarotonga, and a further distribution of budded orange-trees will be made during 1947. The establishment of the full number of one hundred plots will be completed as soon as the young trees are available.

It is hoped that it will be possible to establish citrus seedling nurseries in Atiu and Mauke during 1947.

Citrus shipments from the whole Group have been small during 1946 owing to the damage sustained during the severe storm experienced in January. Prospects for 1947 after a calm "hurricane season" are however much better.

Tomatoes were extensively planted to make up for the loss of the citrus crop, and a record total of 78,761 boxes was shipped.

The few remaining banana plantations were partially wiped out by the storm in January, 1946, and until shipping prospects improve there is little hope of interesting growers in re-establishing this industry. The Administration has established nurseries for propagation of banana shoots so that when it is possible to revive the industry shoots will be available for the replanting scheme.

In Aitutaki, arrowroot has been extensively cultivated, and 81 tons have been processed and exported. Mangaia shipped 708 cases of pineapples to New Zealand. The extension of these industries may well assist in providing cargo during the lean period between orange seasons.

Copra production has increased, and Penrhyn and Aitutaki have recommenced the export of this commodity.

The outer islands rely to a much greater extent on native food crops than Rarotonga does, but greater interest has been evinced in these crops during the year in Rarotonga, with the result that there has been no shortage of native vegetable foods.

REFERENCES.

(1) 1947. Territory of Western Samoa. Twenty-fourth Annual Report on the Administration for the year ended 31st March, 1947. Wellington, N.Z., page 24.

(2) 1947. Cook Islands. Report on Administration for the year ended 31st March, 1947. Wellington, N.Z., page 13.

REVIEWS

1. IMPERIAL AGRICULTURAL BUREAUX

The seventeenth annual report of the Executive Council of the Imperial Agricultural Bureaux for the period 1945–46 has recently been received. This provides a very interesting summary of the work of the Council and of the organizations which work under it. These are the Imperial Institutes of Entomology and Mycology, the Imperial Bureaux of Soil Science, Animal Health, Animal Nutrition, Animal Breeding and Genetics, Pastures and Forage Crops, Horticulture and Plantation Crops, Agricultural Parasitology, Dairy Science and Forestry. A new branch of the Institute of Entomology, *viz.* the Imperial Parasite Service, deals with the extremely valuable work of breeding and shipping to all parts of the world of large numbers of beneficial insects.

It may be of interest to local readers to know that the advisory services and publications of all these Bureaux are available to the officers of the Fiji Department of Agriculture and through them to the general farming public. The appropriate specialist officers of the Department act as official correspondents to the various Bureaux, and all branches of the Department are able to share, wherever necessary, the benefit of the wide experience and scientific knowledge of their consultant Directors and staff. For example, the Report records that the Imperial Institute of Entomology, working in collaboration with the Entomologist, sent 319 identifications of insects to Fiji during the year under review.

Eight technical communications were issued by Bureaux and the valuable abstracts and indices were continued.

Reference is made to the British Commonwealth Scientific Conference which, within 11 months of the close of hostilities, met in the United Kingdom " to consider the best means of ensuring the fullest possible collaboration between the civil government scientific organizations of the Commonwealth ". Opportunity was taken to arrange for a meeting of the long-overdue Review Conference which periodically examines and advises on the activities of the Bureaux.

The report, covering as it does the extraordinarily difficult period immediately after the cessation of hostilities, bears witness to the remarkable way in which institutions in England, even those in the track of the flying bombs, carried on their work. The interchange of scientific information, the pooling of scientific resources and endeavour which developed so greatly during the war have established relations which it is hoped will be adapted and extended in the years of peace which are to come. —B.E.V.P.

2. COCONUTS AND COPRA IN CEYLON

Two publications recently received contain much information which will be of general interest to copra producers in Fiji. The first of these(1) contains a number of papers to be read before the coconut conference at Colombo, and the paper by Dr. Reginald Child, Director of the Coconut Research Scheme, on the regeneration of estates is of particular interest as it refers to the necessity for the replacing of large age-groups of palms which have reached or are approaching senility.

The acreage of coconuts in Ceylon is approximately 1,100,000 acres, as compared with Fiji's 100,000 to 120,000 acres. A little over 100,000 acres is represented by A estates, which are classed (for census purposes) as those estates of 20 acres or more, employing 10 or more resident labourers and for which the census schedule is made up in the English language; two-thirds of the total acreage consists of small holdings, the same proportion as in Fiji. The average annual yield per acre is said not to exceed 1,800 nuts but on A estates the overall figure is not less than 2,114 nuts per acre and in one district averages 3,000 nuts per acre over 17,000 acres. The latter figure corresponds to a yield of 11½ cwts. copra per acre under Ceylon conditions; in Fiji the average is usually estimated at between six to eight cwts. per acre. Manuring is common practice on Ceylon estates.

As in Fiji, a considerable proportion of

the estates coconut acreage is due for replanting. The era of expansion was during the 1880's and the 1946 census shows that, for A estates, the distribution by age groups is as follows: Under 10 years, 8·7 per cent; 10–30 years, 28·8 per cent; 30–60 years, 52·8 per cent; over 60 years, 9·7 per cent. The replanting target necessary to maintain output is suggested as 10,000 to 15,000 acres a year.

The second paper(2), also by Dr. Child, contains an interesting analysis of the cost of production of coconuts and copra on estates. The average cost in 1931 is stated to have been approximately £3 10s. 0d. a ton and in 1935 approximately £3. Costs during the period 1942–45 for a large group of estates are given in detail; these show that costs had risen very little by 1941 but between 1941 and 1945 they rose by between £4 to £5 a ton. Manuring as generally practiced cost about 15s. an acre in 1939. The same programme would have cost £1 17s. 6d. per acre in 1945, but in fact the manuring programme was limited and some decline in yield is anticipated.

It is estimated that on estates where reasonable manuring, cultivation and maintenance are carried out, labour costs represent between 30 and 40 per cent of the total cost of production. Before 1930 labourers were paid about one rupee a day (1s. Fiji currency); by 1932 this had fallen to 6d. and even 4½d. and in 1945 is given as 1s. 1½d. A rise of 10 cents (1¼d.) in daily wages is calculated to be equivalent to a rise in cost of production of approximately 6s. per ton. An inquiry conducted over 200 estates in 1942 gave a figure of 9·1 acres to each labourer.

A condensation of figures for costs from the tables of the original paper is given below, with conversion to Fiji currency at the present rate of exchange.

REFERENCES.

(1) Papers to be Read before the Coconut Conference, Colombo, July 4th, 1947.
(2) The Costs of Production of Coconuts and Copra in Ceylon. Dr. Reginald Child. Reprinted from "The Ceylon Economic Journal".

TABLE I—SELECTED CEYLON ESTATES (16).
(Total of 4,778 acres.)

Costs.	1941.	1942.	1943.	1944.	1945.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Per acre	2 4 10	2 13 10	3 8 9	3 19 6	4 12 2
Net cost per ton of copra	3 17 9	4 13 4	5 19 4	6 16 7	7 18 5
Curing and despatch	0 16 5	1 1 11	1 7 10	1 12 11	1 13 10
Total cost Colombo	4 14 2	5 15 3	7 7 2	8 19 6	9 12 3
Average selling price in Colombo (from Ceylon Trade Journal)	6 9 5	10 16 8	11 16 0	13 0 0	16 1 9
Net profit per ton	1 15 3	5 1 5	4 8 10	4 0 6	6 9 6

TABLE II—ANALYSIS OF COSTS ON A GROUP OF ESTATES.
(Total of 1,871 acres.)

	Per acre.			Per ton*		
	1941.	1943.	1945.	1941.	1943.	1945.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Superintendence and visiting (Management)	0 13 4	0 16 2	0 19 5	1 3 2	1 8 1	1 13 10
Other general charges	0 4 7	0 11 8	1 0 6	0 7 11	1 0 4	1 15 7
Upkeep	0 7 3	0 8 10	0 13 11	0 12 7	0 15 4	1 4 2
Manuring	0 13 3	1 1 8	0 19 3	1 3 1	1 17 9	1 13 7
Cultivation	0 1 2	0 2 4	0 1 3	0 2 0	0 4 1	0 2 1
Picking and collection	0 3 0	0 4 10	0 7 2	0 5 2	0 8 4	0 12 5
Total cost	2 2 7	3 5 6	4 1 6	3 13 11	5 13 11	7 1 8
Curing and transport costs	....	....	....	0 16 5	1 7 10	1 13 10
Total cost per ton	....	....	....	4 10 4	7 1 9	8 15 6

* Costs per ton calculated on the basis of a "standard" crop of 11½ cwt. per acre. —C.H.

LEGISLATION 1947

At the November Session of Legislative Council, the following Bills were passed:

Public Health (Amendment) Ordinance 1947—by which the control of slaughter-houses and dairies is transferred from the Central Board of Health and local authorities to the Department of Agriculture. The Department took over these services as from 1st October, 1947.

* * *

On the 31st October, Legal Notice No. 158* published under the Defence (General) Regulations 1942 prohibited the slaughter of any cow under six years of age on the islands of Viti Levu, Vanua Levu and Taveuni except by permit.

* 1947 *Fiji Royal Gazette Supplement.* No. 40, p. 146.

* * *

BUTTER.

By Price Control (No. 24) Order 1947 published on the 23rd October the prices per pound of locally manufactured butter were increased by 1d. as follows:—

Within five miles of the Post Offices of Suva, Navua and Nausori: 2s. wholesale, 2s. 1d. retail; Other areas: 2s. 1d. wholesale and 2s. 2d. retail.

* * *

COPRA.

An official announcement on the 3rd December stated that owing to more frequent shipping facilities the local costs of handling copra had decreased by savings in interest and other charges. The management committee of the Copra Board accordingly decided to increase the buying rates by £1 6s. 6d. a ton.

(This was a local adjustment and no advance in the f.o.b. price of copra has been made by the Ministry of Food.)

THE CO-OPERATIVE SOCIETIES REGULATIONS, 1947.

Regulations under the Co-operative Societies Ordinance No. 11 of 1947 make provision for such Societies to be registered.

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ADVISORY COUNCIL ON AGRICULTURE.

The following persons have been appoin ted members of the Advisory Council on Agriculture:—

The Director of Agriculture (Chairman)
The Hon. K. B. Singh.
The Hon. Ratu G. Toganivalu.
The Hon. S. H. Wilson.
Mr. A. B. Ackland.
Mr. W. Clarke.
Mr. W. J. Gatward, Jnr.
Mr. E. H. Griffiths.
Manasa Tauca.
Mr. Ramjati Singh.
Mr. Sada Nand Maharaj.

The terms of reference of the Council are—

"To advise on, and from time to time review, the approved agricultural policy of Government and to make recommendations on other matters submitted in the Council by Government."

* * *

PASTORAL DEVELOPMENT COMMITTEE.

A Committee for the pastoral development of land by the Fijians has been set up with the following membership:—

The Economic Adviser (Chairman).
The Secretary for Fijian Affairs.
The Director of Lands.
The Senior Agricultural Officer.
Mr. H. King Irving.
Mr. J. H. H. Millett.
The Acting Accountant-General.

SOME RECENT VIEWS ON COMPOSTS AND FERTILIZERS

The following extracts give varied views summarizing the stage reached in the controversy "fertilizers only" versus "manures only".

1. THE NEED FOR CO-OPERATIVE THINKING AND ACTION(1).

The comparison of "fertilizers only" with "manures only" is not the real issue There has not been a real change of front on the part of science. If an increased amount of reference to humus has been evident it was because scientists were realizing that their understressing of humus, their greater attention to the newer fertilizer idea had led to misinterpretation. They had taken the humus too much for granted and people had been led to believe that humus was only a sleeping partner to be dispensed with on most occasions.

The practical benefits of the oversweeping humus claims have now been achieved. Few to-day do not acknowledge the humus necessity and the compost heap is no longer despised. The time has come for the orthodox scientist to help in the humus school's work and for the humus people to share their expert knowledge of composting technology with the research stations.

2. THE "ALL ORGANIC" FARMER(2).

Nothing in my farming experience has been more dramatic than the effect of a coat of compost on land which is to grow a heavy crop. Most of our 750 acres of land at Chute have now been refertilized by organic manure during the past seven years and it is not surprising, therefore, that I am now an "all organic" farmer. The following are my main reasons which, I am confident, will appeal to the common sense of all fellow farmers.

(*a*) Humus is essential to soil fertility for it is the source of all life.

(*b*) Humus is the only real food for the soil and its denizens as distinct from a mere stimulant.

(*c*) Humus is the only material which adds fertility and so maintains the capital value of the land.

(*d*) Humus adds an important physical condition to the soil making it more crumb-like, more moisture-retaining and physically capable of greater oxidation, that essential contribution to living organisms and plant growth.

(*e*) Humus creates a physical condition in which wireworm, leather-jackets, eelworm and other pests cannot live.

(*f*) In every respect humus means health and dispels the fear of disease to plant, animal and man.

It should be realized:

(1) You cannot overdo the compost process.

(2) You can overdo the application of artificials.

(3) You are adding to the capital value of the land by the use of compost.

(4) You may be diminishing the value of the land by applying artificial fertilizers.

Therefore be a Compost Farmer and "Go to it" right away.

3. A FARMER DEFENDS FERTILIZERS(3).

Mr. A. E. Brown, who farms 2,200 acres on the Isle of Wight, included the following comments upon artificial fertilizers:—

I do not hold the popular belief that fertilizers of organic origin are necessary as plant food. In my view such belief is biologically unsound; plants take up minerals, not organic substances, and the plant is Nature's agent for converting the minerals into the organic material which is necessary to sustain animal life. Moreover, whether fertilizers are applied as organic or inorganic substances, they have to be converted into mineral compounds before they become available as plant food. It is the mineral element on which the plant lives, and this being so, it is a little difficult to follow the arguments of those who seek to show that healthier crops are grown with dung than with fertilizers . . .

For the building up and maintenance of fertility, therefore, we here depend almost entirely upon purchased inorganic fertilizers.

And what about humus? Well, several hundreds of acres of the land now under crop have, by clearing and draining during the last 20 years, been brought under profitable cultivation. Under previous occupiers they had been allowed to revert to barren heath, gorse, bracken, bog and copse. Long experience has shown that provided good crops are consistently grown, the humus content of the soil can very well be left to take care of itself. For instance, last year a humus test was taken on two fields of 50 acres which deliberately had been given nothing but inorganic fertilizers since 1928. The humus content was found to be 33·3 per cent above the average for that class of land. This land had been farmed by the previous owner on the four-course system with folding sheep, but neither the fertility nor the humus content was abnormally high . . .

The point that can be made is this—if one practical farmer can over some 20 years of experience, use artificials almost wholly and not find that his humus stock rapidly dwindles or that he gets bad results, then at least it seems to show that the gloomier anti-chemical views of the humus school are unsound.

4. ORGANIC MATTER COMPLEMENTARY TO FERTILIZERS(4).

Dr. Salisbury decided against the humus school's thesis in no uncertain terms and the utmost place he would allow for organic matter was as a complement to fertilizers.

"Some people imagine there is some 'special virtue' in farmyard manure or composts, or indeed in all that category of organic substances that are comprehensively referred to as 'muck'—a 'special virtue' that, it is claimed, renders plants grown with these healthier and less susceptible to disease, and, moreover, it is even asserted that the value as human food of crop plants grown with so-called 'natural' manures is high, whereas the use of so-called 'artificial' manures is claimed to be prejudicial both to the health of plants and those that feed upon them, whether animals or humans.

"Whilst no one with any knowledge of soils would deny the value of adequate organic material, there is no evidence worthy of the name for the exaggerated claims just referred to . . .

"It will be realized, from what has been stated above, that the presentation of manurial problems as a controversy concerned with organic manures versus mineral fertilizers is due to confusion of thought and complete failure to apprehend either the facts or the problem. Seen in its proper relation to the mineral nutrients the organic fraction is in no sense a substitute for them but a means *inter alia* of rendering them more effectively available.

"Each renders the other more effective, and though mineral nutrients are indispensable for the growth of plants since they are essential raw materials out of which vegetation is manufactured, yet without the organic material or other colloidal medium the efficiency of the nutrient supply is liable to be impaired and the maintenance of a balanced soil economy but wastefully achieved."

5. THE BALANCED POINT OF VIEW.

Ever since the British discovery of artificial fertilizers about a hundred years ago, these substances have been increasingly used to supply some of the additional plant foods made necessary by the increasing withdrawals from the soil resulting from more intense production. Practical farmers are, however, undoubtedly right in their tenacious faith in organic manures, that is, farmyard manure, crop residues, and other kinds. Science is no less insistent on their importance. Artificial fertilizers are not a substitute for but a supplement to farmyard and other organic manure. The proper use of fertilizers does not poison soils; it enriches them. Certain fertilizers if misused can do harm by introducing soil acidity or forcing up a lush and soft vegetation. But crops, like animals, require a properly balanced diet, and a better understanding of the correct use of fertilizers is undoubtedly necessary.

The highly complex part played by organic matter in the soil is, however, still only imperfectly understood. It may truly be said to constitute one of the greatest of all the ultimate problems of the use of the

land all over the world; possibly it is the greatest of these. To ensure ample research on soil organic matter in its fullest sense should be regarded as an essential of our post-war policy. This research should be of the most fundamental character, and actively directed to the great recognized problems of agricultural production and to the nutritional value of foods as influenced by soil and husbandry. The efficient utilization of urban waste products in connexion with agriculture should also continue to receive close study.

REFERENCES.

(1) D. P. Hopkins. "Chemicals Humus and the Soil" pp. 251, 252.
(2) F. Sykes. "Humus and the Farmer" pp. 238, 239.
(3) A. E. Brown. *Ministry of Agriculture Journal*, Aug. 1944, quoted by Hopkins(1) pp. 243,244.
(5) Dr. Salisbury. *Royal Horticultural Society's Journal*, Oct. 1944, quoted by Hopkins(1) pp. 246.
(4) ———*A Scientific Policy for British Agriculture*, 1944, pars. 36, 37, quoted by Hopkins(1) pp. 237, 238.

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